



## CLINICAL STUDY ON URINARY TRACT INFECTION WITH SPECIAL REFERENCE TO BACTERIOLOGY AND THEIR SENSITIVITY PATTERN IN A TERTIARY CARE CENTRE OF NORTH-BENGAL

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**ABSTRACT** **Background:** Urinary tract infections (UTIs) are the most common bacterial infection encountered in tertiary care settings UTI is one of the most common bacterial infections in humans and a major cause of morbidity. Its antibiotic sensitivity pattern varies with the widespread availability of antimicrobial agents; UTI has become difficult to treat because of appearance of pathogens with increasing resistance to antimicrobial agents. **Methods:** This prospective and observational Study was conducted on patients attending the outpatient and indoor admitted patients at North Bengal Medical College at Darjeeling district of West Bengal. From 2016 to 2018. A total 100 patients were taken who having clinical features of UTI. The study region covers the various districts of North Bengal. Template was generated in MS excel sheet and analysis was done on SPSS 20.0 software. **Results:** Among 100 UTI patients, 34 (34%) were male and 66 (66%) were female. The majority of patients (30%) were 46-60 yrs of age. In the study group symptomatic presentation in order of frequency were, dysuria 85%, urgency 74%, fever with chill 60%, hypogastric pain and tenderness 70%, flank pain 30%. E. coli & klebsiella were most common isolates among i.e 66% and 11% respectively. Proteus were sensitive to Netilmicine 90%, Imipenem 87%, Meropenem 79%, Amikacin 75% Gentamycin 68%, levofloxacin 82% of patients. **Conclusions:** In the present study, females (66%) were mostly affected and the most common organisms were E. coli and Klebsiella. These organisms were most sensitive to Amikacin, Nitrofurantoin etc. The sensitivity and resistance pattern of uropathogens to common antimicrobial agents must be taken into account when selecting treatment plans for UTI.

**KEYWORDS :** Urinary Tract Infection, Bacterial Isolates, Sensitivity Patterns

### INTRODUCTION:

Urinary tract infection is the most common bacteriological infection managed in general medical practice and accounts for 1-3% of consultation<sup>1</sup>. Urinary tract infection is common and painful human illness causing morbidity and hospital admission that fortunately is rapidly responsive to modern antibiotic therapy. Except among infants and the elderly, UTI occurs far more commonly in females than male<sup>2</sup>. This infection are in increasing in among all age group and huge attendance in and outpatient department.

Urinary tract infections are one of the most prevalent extraintestinal bacterial infection. It is a common disease encountered medical practice affecting people of all age group. UTI is defined as the microbial invasion of any tissue of urinary tract extending from renal cortex to urethral meatus<sup>1</sup>, between 1 year and 50 years of age, UTI and recurrent UTI are predominant disease in female<sup>2</sup>. More than half of all healthy women experience at least one symptomatic UTI in their lifetime. UTI is uncommon in men in normal genitourinary tract but increase after the age of 65 yrs, primarily attributable to prostate hypertrophy and prostaticitis<sup>3</sup>. UTI is also one of the most common hospital acquired infections<sup>3</sup> UTI is the initiating events in nearly 10% of patients with sepsis in the intensive care units<sup>4</sup>. Common spectrum of presentation of urinary tract infection are 1) asymptomatic bacteriuria, 2) symptomatic acute urethritis and cystitis, 3) acute pyelonephritis, 4) acute prostaticitis, 5) septicaemia (usually gm -ve bacteria)<sup>1</sup>. Aim of our study is to assess the changing pattern of susceptibility of urinary pathogens to antimicrobial agents in UTIs.

Here we studied 100 patient attending in opd and admitted in indoor with features of UTI in a tertiary care centre, North Bengal Medical College a part of North Eastern India, is a draining area of four states and three countries (Bangladesh, Nepal, Bhutan). Patients were evaluated with history, clinical examination, routine urine test, and culture sensitivity, ultra sonography of abdomen. We assessed the commonest pattern of organism and their sensitivity pattern.

### Objectives:

The objective of the study is to know the prevalence and patterns of urinary tract infection. type commonly offending organism and their

sensitivity pattern and to make easier the empirical therapy before culture sensitivity reports.

### METHOD AND MATERIALS:

This study was a prospective observational study and was carried out on patients attending at outpatient and indoor admitted patient at North Bengal Medical College at Darjeeling district of West Bengal. From 2016 to 2018. A total 100 patient was taken who having clinical features of UTI (fever with or without chill, nausea, dysuria, urgency, haematuria, lower abdominal or flank pain etc.) & urine cultures show significant growth were included in this study. Urine sample were collected for routine microscopic examination and culture sensitivity in age group were above 12yrs. Other investigation done are routine complete blood count, blood sugar, HIV test, LFT, USG abdomen. We took those patients who have significant growth in urine sample.

### Sample Collection:

Clean catch midstream urine was collected from each patient in a sterile universal container, sample s were sent to laboratory after properly capped and leveled and processed within two hours to ensure maximum recovery of organisms.

### Inclusion Criteria (on the basis of diagnosis of UTI):<sup>(2,3)</sup>

Detection of bacteria in urine culture is the diagnostic gold standard for UTI.

1. Significant bacteriuria—colony count  $>10^5$ .
2. Women with symptoms of cysytitis that have colony count threshold of  $>10^2$ .
3. Asymptomatic bacteturia  $> 10^5$  colony count and  $>10^2$  in catheter associated disease.

### Exclusion Criteria:

1. Patient below  $<13$  yrs of age
2. Patient with negative urine culture
3. Not willing to participate in this study were excluded.

### Statistical Analysis

Microsoft word 2007 was used to generate tables. Descriptive statistics were used to interpret results using SPSS 20.0 software.

**RESULTS :**

In our study total 100 patients were included between the age of 18 to 80 yrs. those were suffering from features of UTI and on the basis of inclusion criteria. Among them 18% were in 18-30yrs age, 29% were in 31-45yrs, 32% in 46-60yrs and 21% between 60-80 yrs. The prevalence of UTI is high among females (66%) than males (34%) in our study. Females of the reproductive age group (18-45years) constituted 47% of the total patients with UTI. However, elderly (61-98 years) males had a higher incidence of UTI (13%) compared to the elderly females (8%). The elevated incidence of infection among females is related to the differences between male and female genitourinary systems in anatomy and host factors such as changes in normal vaginal flora<sup>6</sup>. **(Table 1 and 2)**

E.coli & klebsiella were most common isolates among and 66 and 11.9% respectively. Pseudomonas was responsible for 7% of the infections while the rest were accounted for Proteus sp.5%. Coagulase negative staphylococci (2.4%), Staphylococcus aureus (3.6%), and fungal 2%. **(Table 3)**.

In our study group symptomatic presentation in order of frequency were, dysuria 85%, urgency 74%, fever with chill 60%, hypogastric pain and tenderness 70%, flank pain 30%. Among the predisposing factors, diabetes mellitus, benign prostatic hypertrophy, renal stone, pregnancy, were important. **(Table 4)**

Predominant USG finding were thickened urinary bladder in chronic UTI, BHP, pyelonephritis and renal calculi. **(Table 5)**

The isolated bacteria showed wide range of variability in their susceptibility pattern to antibiotics. High proportions of the test organisms were sensitive to imipenem, meropenem nitrofurantoin, levofloxacin, ceftazidime, netilmicin, amikacin, gentamicin and ceftriaxone.

E coli were sensitive to nitrofurantoin in 49 (74.24%), levofloxacin 48 cases (72.72%), Netlimycine 52(78.78%), Imipenem 50(75.75%), Amikacin 49(74.24%), Meropenem 48(72.72%). Gentamycin 47 (71.21%) cases. **(Table 6)**

Klebsiella were sensitive to Imipenem 86%, Meropenem78%. Amikacin 74%, Gentamycin 72%, Netlimycine 79% nitrofurantoin 76%, levofloxacin 68% of caseS. **(Table 6)**

Pseudomonas were sensitive to Netlimycine 88%, Imipenem 85%, Meropenem 80%, Amikacin 82% Gentamycin 76%, levofloxacin 65%, of patients. Proteus were sensitive to Netlimycine 90%, Imipenem 87%, Meropenem 79%, Amikacin 75% Gentamycin 68 %, levofloxacin 82 % of patients.Staphylococcus(no=6) was found in 6% cases, coagulase negative staphylococci (3.2%), *staphylococcus aureus* (1.6%), they were highly sensitive to vancomycin (100%), Linezolid (100%), Tigecycline (100%), Imipenem (95%), Meropenem (90%), Amikacin (78%), Gentamycin (75%). *Enterobacter* spp. also seen in (2.4%) of patient. **(Table 6)**

**Table 1. Gender Distribution Of Patients With Urinary Tract Infections:**

Gender	No of pt	Percentage (%)
Male	34	34%
Female	66	66%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Table 2 : Age And Gender Distribution Of Patients With Urinary Tract Infections**

Age group (in years)	Male		Female-No(%)		Total	
	No.	%	No.	%	No.	%
18-30	3	3%	15	15%	18	18%
31-45	7	7%	22	22%	29	29%
46 60	12	12%	20	20%	32	32%
61-80	13	13%	8	8%	21	21%

**Table-3: Frequency Of Isolated Organism From Urine Culture**

Bacterial pathogens	Male		Female		Total Patients	
	No	%	No	%	No	%
E coli	19	19%	47	47%	66	66%
Klebsiella	4	4%	7	7%	11	11%
Proteus	2	2%	3	3%	5	5%
Enterobacter	0	0%	1	1%	1	1%

Staph aureus	0	0%	5	5%	6	6%
Staph saphrophyticus	0	0%	1	1%	1	1%
Enterococcus sp	0	0%	1	1%	1	1%
Candida	1	1%	1	1%	2	2%
Pseudomonas	3	3%	4	4%	7	7%

**Table-4: Symptomatic Presentation (n=100)**

Symptoms	No	%
Dysuria	85	85%
Urgency	74	74%
Hypogastric tenderness	65	65%
Fever with chill	60	60%
Haematuria	8	8%
Cloudy urine	15	15%
Flank pain	30	30%
Asymptomatic	15	15%
Confusion/disorientation	12	12%

**Table-5 : Risk Factor Association (n=100)**

Risk Factors	No	(%)
Diabetes mellitis	58	58%
BHP	46	46%
Renal calculi	35	35%
Obstructive uropathy	26	26%
Immunocompromised state	25	25%
pregnancy	10	10%

**Table-6. Comparison Of Antimicrobial Sensitivity**

Antimicrobial Susceptibility pattern (%) of bacterial agents isolated from urine specimens					
Drugs	Bacterial agents				
	E.coli (no=66)	Klebsiella (no=11)	Pseudomonas (no=7)	Proteus (no=5)	Staphylococcus (no=6)
Nitrofurantoin	49 (74.24%)	76 (%)	26 (%)	59 (%)	63 (%)
Levofloxacin	48 (72.72%)	68 (%)	65 (%)	82 (%)	65 (%)
Ciprofloxacin	25 (37.87%)	22 (%)	27 (%)	41 (%)	45 (%)
Ofloxacin	19 (28.78%)	34 (%)	29 (%)	40 (%)	NT
Moxifloxacin	20 (30.30%)	25 (%)	nd	nd	NT
Azithromycin	23 (34.84%)	26 (%)	nd	nd	NT
Cefixime	22 (33.33%)	28 (%)	22 (%)	nd	NT
Cepipime	22 (31.81%)	30 (%)	26 (%)	nd	NT
Apicillin /Sulbactam	43 (43.93%)	NT	NT	NT	NT
Piperacillin /Tazobactam	15 (22.72%)	45 (%)	44 (%)	36 (%)	65 (%)
Cefotaxime	21 (31.81%)	38 (%)	42 (%)	29 (%)	56 (%)
Ceftriaxone	31 (46.96%)	58 (%)	49 (%)	46 (%)	60 (%)
Ceftazidime	26 (39.39%)	60 (%)	60 (%)	53 (%)	nt
Gentamycin	47 (71.21%)	72 (%)	76 (%)	68 (%)	75 (%)
Amikacin	49 (74.24%)	74 (%)	82 (%)	75 (%)	78 (%)
Imipenem	50 (75.75%)	86 (%)	85 (%)	87 (%)	95 (%)
Meropenem	48 (72.72%)	78 (%)	80 (%)	79 (%)	90 (%)
Tigecycline	23 (34.84%)	65 (%)	NT	NT	100 (%)
Linezolid	NT	NT	NT	NT	100 (%)
vancomycin	NT	NT	NT	NT	100 (%)
Netlimycine	52 (78.78%)	79 (%)	88 (%)	90 (%)	nd

**DISCUSSION**

UTI being one of the most common bacterial infection in all age group causing morbidity. Spectrum of disease varies from asymptomatic bacteriuria, acute urethritis, cystitis, prostatic to life-threatening acute pyelonephritis and septicaemia<sup>6,7</sup>. Early identification and initiation of appropriate treatment reduces the morbidity, hospital admission, and mortality, and antimicrobial resistance.

In my study total 100 patient between the age of 18 to 80 yrs were suffering from UTI. There was remarkable gender difference with a female preponderance upto the age of 60 yrs. The elevated incidence of infection among females is related to the differences between male and female genitourinary systems in anatomy and host factors such as changes in normal vaginal flora<sup>8</sup>.

Females of the reproductive age group (18-45years) constituted 37% of the total patients with UTI. Among males an increased prevalence of UTI was recorded in elderly age group 60-80 (21%) than young

(8%). This is probably because with advancing age, the incidence of UTI increases in men due to prostate enlargement and neurogenic bladder. Similar result showed in study done by Rama Biswas et al (2014) and Srikanta Chowdhury and Ramendu Parial (2015) from Bangladesh, published in SMJ, Sikkim.

Among the symptomatology dysuria 85%, urgency (80%), fever (60%) followed by suprapubic pain & tenderness were the most common presentation in sequence. Similar result seen in study done by pranit kakde et al. published in japi (2018)<sup>10</sup>. In study conducted by Mahesh E et al. fever was the most common symptoms followed by dysuria. Wide range of age group, small sample size may cause this little difference.

In small group of patients had loin pain, cloudy urine, altered mental status needed hospitalization. USG abdomen showed pyelonephritis, renal calculi. Hyponatremia was frequent in altered mental status patients in specially in elderly. A confusional states sometimes may be the initial presentation of UTI in elderly, diabetic, chronic catheterised & immunocompromised patients noted. Associated hyponatremia being detected as a common cause for altered mental status.

In our study gram negative organism were the most common isolates responsible for UTI in 90% of cases. *E. coli* being the commonest organism (66%) followed by *Klebsiella* species (11%), coagulase negative *Staphylococcus* 7 (16.7%), *S. aureus* 6 (14.3%), *Pseudomonas* 7%, *Proteus* species (5%) and *Enterococcus* species. Although the percentage of *E. coli* is much higher in our study, it supports the previous findings indicating that *E. coli* is the principal etiological agent of UTI, accounting for 82.6% Bangladesh study published in SMU Medical Journal, Sikkim<sup>11</sup>. In another Indian study by pranit kakde et al. published in JAPI (2018)<sup>10</sup> from Mumbai, it was reported that predominant uropathogens are *E. coli* (43.36%) followed by *Klebsiella* species which also support our study.

The most effective antimicrobial agents in our study were nitrofurantoin, levofloxacin, gentamicin, and amikacin, netilmicin, ceftriaxone, ceftazidime (Table 5). It has been reported that amikacin is the most effective antibiotic against *E. coli*<sup>12</sup>. Our result was further supported by another study where the susceptibility rate of *E. coli* to amikacin remained 93-100%<sup>13</sup>. In our study, *E. coli* were sensitive to nitrofurantoin in 49 (74.24%), levofloxacin 48 cases (72.72%), Netilmicine 52 (78.78%), Imipenem 50 (75.75%), Amikacin 49 (74.24%), Meropenem 48 (72.72%). Gentamycin 47 (71.21%) cases. Among oral drugs Nitrofurantoin and levofloxacin showed strong activity against 4.24% and 72.72% respectively of all isolated organisms and were very active against.

*E. coli* and *Staph aureus* particularly. However Nitrofurantoin has weak activity against *Proteus* spp and *Pseudomonas* spp. It has also been shown to be very safe in pregnancy<sup>14</sup> and also a recent study in India showed that Nitrofurantoin had the best in-vitro susceptibility profile against *E. coli*<sup>15</sup>. Higher sensitivity of nitrofurantoin of *E. coli* to Nitrofurantoin may be influenced by nitrofurantoin's narrow spectrum of activity, limited indication, narrow tissue distribution and limited contact with bacteria outside the urinary tract<sup>16</sup>. Supported by another study, Talan et al., 2000, Raz et al., 2002). Since a very high percentage of isolates in this study were sensitive to nitrofurantoin, this drug would be a better choice for UTI therapy in ambulatory and for OPD patients; it could be administered while waiting the culture result. Good sensitivity also seen in cefotaxime, cefotaxime+salbactam, ciprofloxacin, azithromycin. Again, most of the pathogens showed considerable resistance to amoxicillin, cefixime, cotrimoxazole and nalidixic acid, fluoroquinolones except levofloxacin. The widespread use, more often the misuse, of antimicrobial drugs has led to a general rise in the emergence of resistant bacteria.

#### CONCLUSION AND RECOMMENDATIONS:

The knowledge about the sensitivity pattern would help the clinician to initiate appropriate antimicrobial agents empirically in some critically ill patients when sensitivity reports are not available and to reduce the rate of morbidity as well as limit the increasing rate of drug resistance among bacteria. Proper investigation and prompt treatment are needed to prevent serious life threatening condition and morbidity due to UTI. Different studies on growing resistance among UTI causing pathogens have been going on for the last few decades and the available data and reports showed that the increase in resistance to commonly prescribed antibiotics is a consequence of inappropriate use of the antimicrobial agent and the extent and nature of treatment does not remain the same

for all group of people.

Resistance among the pathogens is an issue of serious concern and requires an immediate attention about the sensitivity pattern in order to derive suitable remedy to overcome the problem. During the era of emerging antimicrobial resistance it is strongly recommended that the antibiotic therapy should only be commenced after the culture and sensitivity report from the microbiology laboratory. This would not only help in the sensible use of antibiotics but also would restrain the spreading of antimicrobial resistant strains in the community as well as in the hospital.

It is also important to carryout constant local surveillance of the antibiotic sensitivity pattern of UTI pathogens for commonly used antimicrobial agents in a particular environment as rates of ABR can vary between settings and over time, to start the empirical antimicrobial therapy in a seriously ill patient when sensitivity reports are pending.

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**Ethical Approval:** The study was approved by the institutional ethics committee

#### Abbreviation:

UTI=urinary tract infection  
BHP=benign prostatic hypertrophy  
LFT= liver function test.  
HIV=human immunodeficiency virus  
USG=ultrasonography  
SMU=Sikkim Manipal University  
SMJ=Sikkim Manipal Journal  
ABR=antibiotic resistant.  
*E. coli*= *Escherichia coli*  
*Staph aureus*=*staphylococcus aureus*  
Japi= Journal of The Association of Physician of India

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